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Project No. 25.4800

Petroleum Supply of North Vietnam

Contribution by T/TR

Action Division D/R
Action Branch R/FP

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I. Present Method of Transporting Petroleum to and Within North Vietnam

North Vietnam has no indigenous supply of petroleum and no refining capacity and is entirely dependent on imports for the supply of petroleum products. (POL). During 1965 North Vietnam imported about 190,000 short tons* of POL, an increase of about 13 percent compared with imports in 1964. Motor gasoline and diesel fuel accounted for more than 62 percent of the total imports. An estimate of POL imports by type of product is shown in the following table.

Table 1

Imports of POL to North Vietnam in 1965

Type of Product	Quantity (thousand short tons)	Percent
Motor gasoline	66.1	35.1
Diesel fuel	51.8	27.4
Kerosene	52.9	28.0
Lubricants	15.4	8.1
Jet fuel	1.9	1.0
Aviation gasoline	0.8	0.4
	188.8	100.0

About 97 percent of the POL was supplied by the USSR while Rumania and Communist China supplied the remainder. There were no known imports of POL from non-Communist suppliers during 1965. Ocean tankers delivered more than 165,000 tons and dry cargo ships delivered about 12,000 tons during 1965. This amount, delivered through the port of Haiphong, represents almost 95 percent of the total imports in

* Unless otherwise stated, tonnages are given in short tons throughout this report.

1965. The remainder or about 12,000 tons was delivered overland from China or from the USSR through China. During the first five months of 1966 imports increased by at least 50 percent above the corresponding period in 1965. If this rate is maintained throughout the year, imports in 1966 will amount to about 300,000 tons. A substantial increase in the number of motor vehicles in North Vietnam during late 1965 and early 1966 probably accounts in part for an increased demand for POL, particularly motor gasoline and diesel fuel. However, there is also considerable evidence that a program was underway during the first five months of 1966 to build up a reserve supply of POL and these reserves were being dispersed throughout the country in steel drums and small storage tanks some of which have been buried underground. It is estimated that the capacity of fixed storage facilities in use as of 1 June 1966 was about 180,000 tons and dispersed storage facilities may account for another 8,000 tons. The major bulk storage facilities are at Haiphong. 79,000 tons and at Hanoi, 37,000 tons. These two installations account for nearly 60 percent of the total bulk storage capacity. Moreover, almost all of the remainder of the fixed bulk storage facilities are located within a radius of about 75 miles of Hanoi. The location and capacities of the principal bulk storage facilities are shown in Table 2.

Table 2

North Vietnam
Principal Bulk Petroleum Storage Facilities

Location	Capacity (Short Tons)	Served by (Mode of Transport)
Haiphong	79,000	rail, road, water
Hanoi	37,000	rail, road
Vinh	2,000	rail, road, water
Nguyen Khe	14,000	rail, road
Phuc Yen	15,000	rail, road
Bac Giang	7,000	rail, road, water
Do Son	4,000	road, water
Viet Tri	4,000	rail, road, water
Phu Qui	2,000	road
Duong Nham	15,000	road, water
Kep	1,000	road
	180,000	

Considering the fact that the fixed bulk storage capacity is just about equal to total imports of POL in 1965 it would appear that storage capacity is far in excess of requirements to maintain an even flow of supplies to consumers. The storage facilities at Haiphong are not only the largest but are also the most important because they are the only facilities capable of receiving liquid POL direct from ocean tankers. The ocean tankers can discharge cargoes directly to those facilities through pipelines on the jetties although some POL is off loaded to lighters, tank barges and other water craft for delivery elsewhere. Moreover, these facilities are equipped to load railroad tank cars, tank trucks, coastal vessels and inland water craft and they also have packaging facilities to fill drums and other small containers. Almost all of the liquid POL imported to North Vietnam passes through the Haiphong storage facilities. Delivery to other bulk storage

facilities is accomplished by rail, road, inland water and coastal vessels, but the bulk of the POL probably is shipped from Haiphong by rail to those storage facilities served by rail. Hanoi which is second in terms of capacity is also second in importance. It is centrally located and readily accessable to the principal consumers. The facilities at Hanoi also are equipped to trans-load to all modes of transport and to package petroleum products. Deliveries to the ultimate consumers from all bulk storage facilities is accomplished principally by truck.

II. Consumption and use of POL

A. Civilian Consumption of Motor Gasoline and Diesel Fuel

One of the principal consumers of POL is the public transportation industry in North Vietnam. It is estimated that public road transport alone carried about 8.7 million tons of freight for 137 million ton miles in 1965.* This operation would have required the use of 6,700 trucks and would have consumed about 47,000 tons of motor gasoline and diesel fuel. Another major consumer of motor gasoline and diesel fuel is the inland water and coastal shipping transport enterprises. It is estimated that these enterprises carried about 8.9 million tons for 486 million ton miles in 1965 and at least 75 percent of the traffic or 365 million ton miles was carried on or towed by powered vessels using motor gasoline or diesel engines. At the rate of 80 pounds of fuel per 1,000 ton miles, this traffic would have consumed about 15,000 tons of motor gasoline and diesel fuel in 1965. The third major consumer among the transportation enterprises is the port operations. The barges, dredges, lighters and tugs in use at the ports probably consumed about 11,000 tons of fuel in 1965. Passenger cars, buses and taxis consumed about 3,500 tons and public administration vehicles such as ambulances, fire and police vehicles about 500 tons. Thus, civilian transportation consumed an estimated 77,000 tons of motor gasoline and diesel fuel in 1965 or more than 65 percent of the imports of those products in 1965.

B. Military Consumption of Motor Gasoline and Diesel Fuel

It is estimated that there are more than 6,000 motor vehicles assigned to the Armed Forces in North Vietnam. Of this total about 80 percent or 5,000 vehicles

* CIA estimate: Includes military cargo carried on civilian trucks but excludes cargo carried on trucks operated by the Armed Forces.

are in regular daily use and the remaining 20% are out of service for maintenance and repair. Some of the military vehicles such as those operating in the Laotian corridor and in Military Region IV are used intensively while those on garrison are not. It is estimated that the 5,000 military vehicles in use by the armed forces consumed about 27,000 tons of motor gasoline and diesel fuel in 1965 or almost 23 percent of the imports. In total, civilian public transportation and the motor vehicles used by the armed forces consumed about 104,000 tons of fuel in 1965 or 88 percent of the motor gasoline and diesel fuel imported in 1965. Table 3 shows the consumption of motor gasoline and diesel fuel by public transportation and armed forces motor vehicles in 1965.*

* See Table 3 following page 6.

Table 3

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North Vietnam
Estimated Consumption of Motor Gasoline and Diesel Fuel
by Civilian and Military Transportation in 1965*

Consumer	Consumption (Short Tons)	Percent by Transport Consumer	Total Imports (Short Tons)	Percent of Imports Consumed by Transport
1. Civilian Transport				
a. Trucks (cargo)	47,000	45.1		39.9
b. Passenger cars, buses, taxis	3,500	3.4		3.0
c. Public administration (health, fire, police)	584	.5		.5
d. Inland water and coastal shipping	15,000	14.4		12.7
e. Port operations (barges, dredges, lighters, tugs.)	11,000	10.6		9.3
Total Civilian	77,084	74.0		65.4
2. Military Transport				
a. Trucks, (Laotian corridor)	5,256	5.0		4.5
b. Trucks (Military Region IV)	9,454	9.1		8.0
c. Trucks, (all other)	4,906	4.7		4.2
d. Prime movers	5,506	5.3		4.7
e. Ambulances, jeeps, sedans	1,632	1.6		1.4
f. Armored vehicles	285	.3		22.8
Total Military	27,039	26.0		
3. Grand Total	104,123	100	117,900	88.2

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III. Cost of Transporting POL Imports

A. By Sea

During 1965 about 177,000 tons of POL were transported by sea from Black Sea ports to North Vietnam through the port of Haiphong. This amount represented about 94 percent of the total imports in 1965. It involved a haul of about 8,000 nautical miles requiring a voyage of about 29 days. It is estimated that the current ocean freight rate on POL by tankers from Black Sea Ports to Haiphong is approximately $7.50 per metric ton.

B. By Rail

During 1965 about 12,000 tons of POL were transported by railroad from the USSR to North Vietnam. The railroad freight rate would vary depending upon the point of origin in the USSR. It is logical to conclude however that the Soviets would have shipped by rail from a refinery reasonably close to a border point on the most direct route to North Vietnam through Mongolia and China. It is therefore believed that the major portion of the tonnage originated at Irkutsk where there is a refinery capable of producing all types of petroleum products. The railroad freight rate from Irkutsk via Naushki on the Mongolian border to Erhlien on the Chinese border and thence to Dong Dang on the Chinese-North Vietnamese border, a distance of 5,475 kilometers is $48.80 per metric ton. This rate includes a $1.00 per ton charge for transloading from Soviet wide gauge to Chinese standard gauge cars on the Mongolian Chinese border.* This is 6.5 times the rate by sea from Black Sea ports to Haiphong.

* Combination of local freight rate in the USSR and transit rate through Mongolia and China. The rate is published in old rubles (before the 1961 currency reform) and converted at the rate of exchange of 4 rubles to US $1.

IV. The Effects of Interdiction of POL Supply System at the Port of Haiphong

In the event that the use of the port of Haiphong is denied either by the mining of the harbor and approaches or by the destruction of POL storage and unloading facilities or both, there are two alternate transportation routes open for the supply of POL. One is the overland railroad route from the USSR through Mongolia and China. The other is a combination of a route by sea to a Chinese port and thence overland by railroad and highway and by coastal waterway to North Vietnam.

The railroad route from Irkutsk in the USSR by the most direct route would involve a haul of about 5,475 kilometers (3,390 miles) at a cost of $48.80 per metric ton. It would require the continual employment of 132 freight cars for each 100,000 tons carried in the USSR and about 280 freight cars for each 100,000 tons in China.* Thus, the number of cars required to deliver the 300,000 tons of imports anticipated in 1966 would be 400 in the USSR and Mongolia and 840 in China. This would not overly tax the USSR railroad system as there are about 130,000 tank cars in the USSR. The number of tank cars in China is estimated at about 16,000 and there have been reports from time to time of a shortage. It is believed therefore that China would be unable to allocate 840 tank cars or about five percent of the tank car inventory for the haul without seriously disrupting domestic traffic in POL. The jet fuel, aviation gasoline and some lubricants may move overland by rail but the motor gasoline, diesel fuel and kerosene which comprises more than 90 percent of the imports probably would move by sea to a Chinese port and thence overland and by coastal waterway to North Vietnam.

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The Chinese ocean port closest to the border of North Vietnam and the port most likely to be used is at Fort Bayard (Chan-chiang). The shipping distance from Black Sea ports to Fort Bayard is just about equal to the distance to Haiphong and the ocean freight rate of $7.50 per ton is therefore also applicable. The port at Fort Bayard has a POL storage capacity of 300,000 ~~lbs.~~ bbls or about 37,800 short tons. A standard gauge railroad line runs from the port via Li-tang to P'ing-hsiang on the North Vietnam border, a distance of 655 kilometers (407 miles). The capacity of the railroad is about 5,600 tons per day or about seven times the capacity required to move the daily requirement of 822 tons of POL for North Vietnam.* The number of freight cars required in constant use to move the POL tonnage would be about 170 or about 1.1 percent of the Chinese inventory. The freight rate by railroad from Fort Bayard to Ping-h'siang would amount to about $8.15 per ton and coupled with the ocean rate of $7.50 per ton, total rate would amount to $15.65. This is less than one-third of the overland railroad rate from Irkutsk in the USSR. There is a POL storage depot at P'ing-hsiang with a storage capacity of about 2,000 tons which has pumping facilities to transload POL from Chinese standard gauge railroad cars to North Vietnamese meter gauge railroad cars or tank trucks. It probably has facilities for packaging POL in steel drums for shipment by either rail or truck. In addition to the railroad there is a truck route from Fort Bayard to Ping-hsiang with a daily capacity of more than 900 tons. A second truck route runs from Fort Bayard to Mon Cai on the North Vietnamese border, a distance of about 235 miles and that route has a daily capacity of 1,475 tons. In addition to the rail and road routes, coastal water craft could be employed from Fort Bayard to various small ports in South Vietnam.

* At an estimated 300,000 tons per year in 1966.

Although there is no existing pipeline leading from Fort Bayard to North Vietnam, the possibility of constructing one cannot be ignored. A four inch pipeline is capable of delivering about 900 short tons in a 20 hour day which is well above anticipated daily imports to North Vietnam in 1966. Standard black or galvanized pipe weighs about 11 pounds per linear foot which includes the weight of couplings. This equates to about 26 tons per mile. The distance from Fort Bayard to P'ing-hsiang following the most direct road route is about 400 miles so about 10,400 tons of pipe would be required.* For ease of construction and maintenance the pipeline could be laid along the most direct road route thus taking advantages of existing bridges. Moreover considering the relatively mild climatic conditions in the area the pipeline could be laid above ground using small timber pollow blocks for support. Very little skilled labor would be required except for the installation of pumping stations. Because of its light weight, (a 30 foot section of pipe weighs only 330 pounds), very little heavy construction equipment would be required. A 50 man crew probably could join and lay at least a half a mile of pipe per day and ten such crews working simultaneously on different sections could complete the entire project in under 90 days. Whether or not the pipeline would be laid and the speed of construction would depend upon the magnitude of the problem encountered in using other modes of transport. The cost of transporting petroleum products by pipeline is only about one-fourth of the cost by rail per ton mile. The diversion of POL traffic from Haiphong to Fort Bayard and thence overland to the Chinese-North Vietnamese border would not create any serious distribution problems within

* Annual production of pipes and tubes in China is about 1.1 million tons.

North Vietnam. Railroad tank cars and trucks normally used for the haul from Haiphong to inland storage and distribution facilities would simply be diverted to the rail and road routes leading from the Chinese border to those facilities. The rail and road routes from the Chinese border are completely adequate for the distribution of the POL tonnage anticipated in 1966 unless, of course, an intensive effort to interdict those routes is undertaken in conjumction with the denial of the use of the port of Haiphong. It is unlikely that even a major interdiction of the rail and road routes will stem the flow of a substantial amount of POL from China. It will, however, make the import and distribution of POL more difficult and costly.

APPENDIX A

METHODOLOGY

Methodologies for Estimating Consumption of Motor Gasoline and Diesel Fuel by Civilian and Military Transportation in 1965

1. Fuel Consumed by Civilian Truck Transportation

a. It is estimated that transport performance by civilian trucks totalled about 200 million metric ton-kilometers in 1965, or 137 million short ton-miles.

b. The average load per truck is estimated to have weighed 2.5 short tons. It is assumed that each truck travelled one mile empty for each mile under load.

c. The average rate of fuel consumption by trucks is estimated to be 7 miles per gallon of fuel.

d. Fuel consumed by civilian truck transportation, therefore, is estimated in the following manner:

137,000,000 (short ton-miles of transport performance by trucks) ÷ 2.5 (average load per truck in short tons) = 54,800,000 (miles travelled by loaded trucks) x 2 (factor to account for empty mileage) = 109,600,000 (total miles travelled by civilian trucks engaged in transportation) ÷ 7 (number of miles per gallon of fuel) = 15,700,000 (gallons of fuel consumed) x 6 (average weight in pounds per gallon of fuel) = 94,200,000 (pounds of fuel consumed in 1965)

e. Converting to short tons, it is estimated that about 47,000 short tons of fuel were consumed by civilian truck transportation in North Vietnam in 1965.

2. Fuel Consumed by Civilian Inland and Coastal Water Transportation

a. It is estimated that civilian transport performance by inland and coastal water totalled about 710 million metric ton-kilometers in 1965, or 486 million short ton-miles.

b. About three-fourths of this performance is estimated to have been performed by motorized water craft.

c. In the USSR, about 25 kilograms of diesel fuel is consumed for each 1,000 metric ton-kilometers of transport performance by inland water. Converting these data to pounds and short ton-miles, it is estimated that 55 pounds of diesel fuel are consumed for each 685 short ton-miles of performance, or .08 pound of fuel is consumed for one short ton-mile of performance. This estimate is believed to be valid for inland and coastal water performance in North Vietnam.

d. Fuel consumed by civilian inland and coastal water transportation, therefore, is estimated in the following manner:

486,000,000 (short ton-miles of total transport performance by inland and coastal water) x .75 (percent of total performance by motorized water craft) = 364,500,000 (short ton-miles of performance by motorized water craft) x .08 (amount of fuel consumed in pounds for one short ton-mile of performance) = 29,200,000 (pounds of fuel consumed in 1965)

e. Converting to short tons, it is estimated that about 15,000 short tons of fuel were consumed by civilian inland and coastal water transportation in North Vietnam in 1965.

3. Fuel Consumed by Gasoline and Diesel Powered Water Craft in Port Operations

a. It is estimated that the average number of gasoline and diesel powered water craft in constant daily service at the ports did not exceed 100 in 1965. This includes dredges, barges, junks, lighters and tugs but excludes water craft engaged in inland water and coastal shipping which are accounted for in paragraph 2 above.

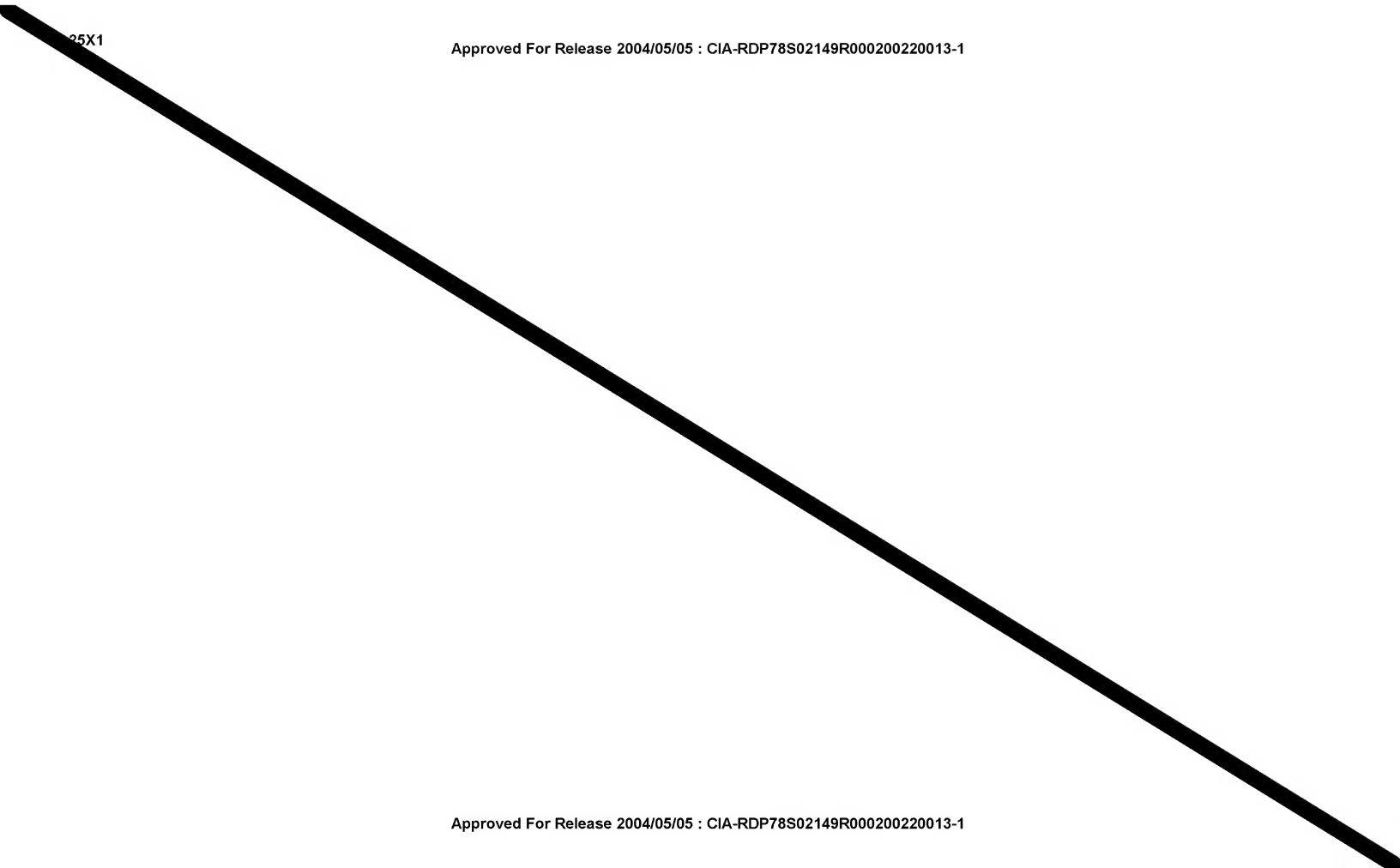
b. It is also estimated that each port craft was in operation on an average of 10 hours per day.

c. Each craft consumed 10 gallons of fuel per hour.

d. Fuel consumed by water craft in port operations therefore is estimated in the following manner:

100 craft x 10 hours per day x 10 gallons of fuel per hour x 6 pounds per gallon = 60,000 pounds = 30 tons of fuel per day x 365 = 10,950 (11,000) tons of fuel consumed per year.

4. The methodology for computing fuel consumption by civilian truck transportation and other civilian and military consumers of motor gasoline and diesel fuel is shown in Methodology Table 1 following this page.



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